

REMARKS

Claims 1, 2, 4-7, 9, 10, and 12 are pending in the present Application. No claims have been canceled, Claims 1, 4, 5, 9, and 12 have been amended, and no claims have been added, leaving Claims 1, 2, 4-7, 9, 10, and 12 for consideration upon entry of the present Amendment.

Amendments to Claims

Claims 1 and 5 have been amended to include the clarifying limitation that the gel polymer is coated over 40-60% of a total separator area based on a surface of the separator to be coated with the gel polymer, support for which can be found in the Application as filed in FIG. 4 (see e.g. reference numeral 13 showing the separator in which a regular pattern of circular regions is shown to be coated on a single side of the separator, i.e., the surface to be coated; see also the Specification on p. 13 lines 6-8 in which the coated area was set to about 50% of the total separator area of the surface.

Claims 4, 9, and 12 have each been amended to replace the term “them” with “the foregoing polymers”, support for which can be found in the exemplary materials disclosed in the markush group in each of these claims, and in the Specification on p. 7, lines 20-28.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 4, 9, and 12 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner considers the markush group reciting “copolymers and crosslinked polymers consisting of at least two of them.”

Applicants note that the entire markush group for each of Claims 4, 9, and 12 recites: “wherein the gel polymer is selected from the group consisting of polyvinylidene fluoride (PVDF); polyethylene glycol diacrylate; polyalkylene glycol diacrylates; polyalkylene glycol dimethacrylates; ether polymers; carbonate polymers; acrylonitrile polymers; copolymers and crosslinked polymers consisting of at least two of ~~them~~ the foregoing polymers; and

fluoropolymers”

As shown, each of these claims has been amended to revise the markush group to replace the term “them” with “the foregoing polymers” to clarify that the “copolymers and crosslinked polymers consisting of at least two” refers to subgroups (copolymer and crosslinked polymers) of any two of the polymers recited in the markush group.

It will be appreciated that “polyvinylidene fluoride (PVDF); polyethylene glycol diacrylate; polyalkylene glycol diacrylates; polyalkylene glycol dimethacrylates; ether polymers; carbonate polymers; acrylonitrile polymers” are all polymers, recited within the markush group prior to the recitation of “copolymers and crosslinked polymers”, and hence “of them”, and more clearly as amended, “of the foregoing polymers” refers to this subgroup of polymers, where the intent of the markush group as written is to show that the polymers (excepting fluoropolymers other than PVdF) may be combined to form copolymers (e.g., block copolymers) or that any two or more of the recited polymers may be crosslinked to form a crosslinked polymer.

Claims 4, 9, and 12, as amended, should in view of the clarifying amendments now be acceptable to the Examiner. Reconsideration and withdrawal of the rejections is respectfully requested.

Claim Rejections Under 35 U.S.C. § 102(b)/103(a)

Claims 1, 2, 4-7, 9, 10 and 12 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as allegedly unpatentable over, U.S. Patent No. 5,853,914 (“Kawakami”).

Claims 1, 2, 5-7, 10 and 12 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as allegedly unpatentable over, U.S. Patent Application Publication No. 2002/0187401 (“Lee”).

Applicants respectfully traverse these rejections.

To anticipate a claim, a reference must disclose each and every element of the claim.

Lewmar Marine v. Varient Inc., 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987).

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art

relied upon, or knowledge generally available in the art at the time of the invention, must provide some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). “A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must “identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does.” *Id.*

Claims 1 and 5 claim a battery separator coated with a gel polymer over 40-60% of its area where the separator is partially coated with a gel polymer in which coated or non-coated areas form a pattern. It has been noted in the background that laminated structures can improve the close contact between an electrode and a separator; however, some features of a battery, such as rapid impregnation of an electrode with an electrolyte, uniform wetting of an electrode with an electrolyte, and a high-rate discharge property, can deteriorate as a result. See Specification, p. 2, line 11 to p. 3, line 12. It has unexpectedly been found that the above-mentioned problems occurring in the prior art are a result of the fact that gel polymer hinders an electrode from being impregnated with an electrolyte.

Accordingly, the claimed invention overcomes these problems with electrolyte impregnation, and provides a rechargeable lithium battery, in which an electrode can be totally impregnated with an electrolyte in a rapid and uniform manner, while uniform and close contact between the electrode and a separator is maintained.

Thus, the claims are distinguishable over the prior art at least in that the separator is not totally, but partially coated with a gel polymer, which provides a path for the permeation of an electrolyte to the separator.

The Examiner has reiterated the rejection of Claims 1 and 5, as anticipated or unpatentable. However, Applicants strenuously disagree with the Examiner’s rejection and assert the Examiner has failed to identify a disclosure or teaching of all elements of these claims, specifically in that Kawakami fails to teach the missing element that the gel polymer is *patterned*.

As to the anticipatory rejections of Claims 1-3, 5-8, 10 and 11 over Kawakami,

Kawakami discloses a rechargeable lithium battery including a pressure means which is pressing an anode and a cathode. Herein, the pressure means may comprise a polymer gel (304) held on a support member (305) (see Fig. 3D).

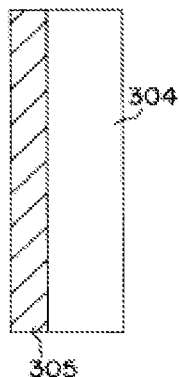


FIG. 3(D)

The pressure means of FIG. 3(D) is formed by casting a solution of an appropriate polymer onto the surface of an appropriate support member and the resultant is subject to crosslinking to convert a polymer or monomer (cast from solution) to a crosslinked polymer gel material. Col. 7, lines 34-53. Kawakami discloses that layer 304 of pressure means of FIG 3(D) may be formed to impregnate pores in the support 305 with the polymer gel material (“pore present in the support member are filled by the polymer gel material”). Col. 8, line 64 to Col. 9, line 3.

Kawakami states, in Col. 5, lines 8-25:

In the present invention, the pressure means comprising the foregoing polymer gel material for pressing the anode and the cathode may be configured such that pressure means comprises a polymer gel material shaped into a sheet-like form (this will be hereinafter referred to as polymer gel sheet). In this case, there are provided advantages in that the volume occupied by the pressure means in the rechargeable lithium battery is minimized, and a uniform pressure is applied against the anode and the cathode.

In the case where the polymer gel sheet is of a configuration formed by subjecting a powdery polymer gel material to press-molding or by dispersing a polymer gel material on or in a support member, the size of the polymer gel sheet can uniformly controlled as desired upon the preparation thereof. The use of such a polymer gel sheet applies a uniform pressure against the anode and the cathode. This situation makes the rechargeable lithium battery have uniform battery characteristics.

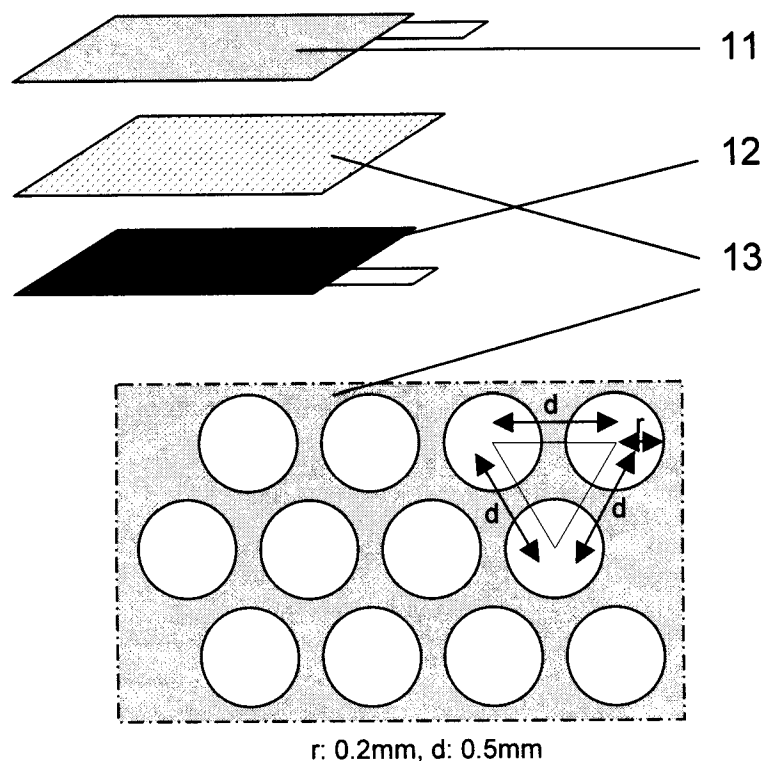
In contrast, in the specification as filed on p. 5, lines 13-17 states that the separator is “not totally coated with a gel polymer but partially coated with a gel polymer” disposed “in a regular pattern, for the purpose of providing a path for the permeation of an electrolyte to the separator.” Further, the specification states on p. 7, lines 12-16, that the “patterned gel polymer is coated on a separator so as to provide a gel polymer-coated part and a non-coated part arranged on the separator in a regular form. As long as a gel polymer-coated part and a non-coated part are arranged regularly, there is no particular limitation in pattern design.”

Kawakami is silent as to a pattern. Kawakami discloses only that when the polymer gel sheet is press molded from a powdery polymer gel material or is dispensed on or in a support, the *size* of the polymer gel *sheet* can be “uniformly controlled.” The skilled practitioner would readily appreciate that based on the operative terms size, sheet, and uniform control, what Kawakami discloses is control of the size of the sheet. It has already been established in Kawakami that the sheet is uniform. There is no disclosure whatsoever in Kawakami that the sheet is *patterned* (i.e., having a regular pattern) as claimed in Claim 1 and disclosed in the instant Specification. Applicants note that the Examiner has interpreted “pattern” occurring in Claim 1 on p.7 of the instant specification “as such” (FOA dated

January 7, 2010, p. 2, section 6). This cited portion of the specification states that pattern has “a gel polymer-coated part and a non-coated part [that] are arranged *regularly*.” It will be appreciated that a regular pattern (a pattern where the gel polymer coated part and a non-coated part are arranged regularly) requires a repeating (i.e., regular) pattern unit. In this way, the Examiner has acknowledged a regular pattern and therefore has acknowledged this limitation. While this is clearly the intent from the instant Specification, that the pattern be a regular, repeating disposition of coated and non-coated parts, the only disclosure of Kawakami from the cited portion of this reference and relied upon by the Examiner discloses the uniform control of the size of the sheet (see cited paragraph of Kawakami above, and in particular, the underlined portion), which one will understand to mean that each sheet is uniform in *size* (length, width, thickness). The skilled artisan will readily appreciate the distinction between the term “size” which refers to overall dimension, and such terms as “regular,” and “arranged regularly”, etc. which would refer to the disposition of a pattern but which do not occur in Kawakami (and where these terms are clearly used in with reference to a pattern in the instant Specification). However, as can be seen in the excerpted passage of Kawakami above (i.e, Col. 5, lines 15-25 relied on by the Examiner), the reference makes no disclosure whatsoever of “pattern” as defined in the instant Specification and as acknowledged and relied on by the Examiner.

Kawakami therefore fails to disclose all elements of the instant Claims 1 and 5 and its dependents, and cannot anticipate the claim. “The identical invention must be shown in as complete detail as is contained in the *** claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Kawakami fails to disclose the element of a *patterned* gel polymer and hence fails to teach all elements of the instant claims, and therefore cannot anticipate the claims. Claim 1 claims that the gel polymer is formed in a pattern on a substrate. Further, the Examiner is reminded that missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780, 227 U.S.P.Q. 773, 777 (Fed. Cir. 1985). Kawakami, which discloses only “a polymer gel material shaped in sheet-like form” which may have be varied in uniform size, fails to disclose a pattern, and thus the layer 304 is not disclosed in Kawakami, in any literal or figurative way, as including a pattern.

In addition, Kawakami fails to disclose the limitation that the gel polymer covers 40-60% of the surface of the separator as a pattern, *based on the surface to be covered*. Instant FIG. 4 illustrates a pattern as instantly claimed:



where, in 13 of FIG. 4, a regularly spaced pattern of circular gel polymer areas is disposed on one coated surface of the separator, meeting the requirement to coat 40-60% of each surface to be coated as clarified in Claims 1 and 5 as amended. It will be appreciated that coating 100% of one surface and 0% of another surface as allegedly disclosed in Kawakami based on the Examiner's interpretation of Kawakami FIG. 3D simply does not amount to the same thing, where 100% coating is greater than the 40-60% of the instant claims, and 0% is less than the 40-60% of the instant claims. See Final Office Action dated January 7, 2010, p. 4, lines 1-2. It will also be understood that coating the entirety of a single surface, or adjusting the *size* of the coated surface (see arguments above with respect to Kawakami, Col. 5, lines 15-25), does not equate to forming a gel polymer pattern covering 40-60% of each coated surface as required by instant Claims 1 and 5 as amended.

In addition, as this is a 102/103 rejection, Applicants contend that the limitations of Claim 1 would also not be inherent to the disclosure of Kawakami. In order to support an anticipation rejection based on inherency, an Examiner must provide factual and technical grounds establishing that the inherent feature necessarily flows from the teachings of the prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Int. 1990); *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981) (holding that inherency must flow as a necessary conclusion from the prior art, not simply a possible one). The methods of coating disclosed in Kawakami do not disclose the formation of patterns on a substrate, but only methods which would provide coating *uniform* in size (casting, powder coating, etc.). Further, Kawakami clearly discloses filling of free pores in the substrate 305 by the gel polymer layer 304 which one skilled in the art will recognize as effecting both a complete and thorough coverage of a surface, where the gel polymer interpenetrates with the substrate. Kawakami is silent as to pattern formation in a gel polymer layer. One skilled in the art will appreciate that as such processes may tend to teach complete coverage, they do not teach that a pattern would *necessarily* form. Applicants contend that based on the teachings of Kawakami, there no teaching that anything other than a complete and uniform coating would *necessarily* (i.e., of necessity) be formed. Therefore, there is no indication that the limitation of a patterned gel polymer layer would be inherent to the disclosure of Kawakami. For at least the foregoing reasons therefore, Kawakami does not explicitly or implicitly anticipate Claims 1 and 5.

As to the obviousness rejections over Kawakami, Kawakami fails to provide a suggestion or incentive that would lead one skilled in the art to modify Kawakami to provide a patterned gel polymer layer. Kawakami is silent as to a patterned gel polymer layer, and hence fails to render the claims *prima facie* obvious. Further, Kawakami teaches methods of deposition that would not produce a patterned layer. *In re Laskowski*, 871 F.2d 115, 117, 10 U.S.P.Q.2d 1397, 1398 (Fed. Cir. 1989) (“Although the Commissioner suggests that [the structure in the primary art reference] *could* readily be modified to form the [claimed] structure, ‘[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification’”) (citation omitted); *In re Stencel*, 828 F.2d 751, 755, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987)

(obviousness cannot be established “by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion that the combination be made”). *In re Laskowski*, 871 F.2d 115, 117, 10 U.S.P.Q.2d 1397, 1398 (Fed. Cir. 1989) (“Although the Commissioner suggests that [the structure in the primary art reference] could readily be modified to form the [claimed] structure, ‘[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification’”) (citation omitted); *In re Stencel*, 828 F.2d 751, 755, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987) (obviousness cannot be established “by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion that the combination be made”).

In a rechargeable lithium battery having the structural features claimed in the instant claims, a path for discharging gases generated from electrode reactions is provided by the presence of the claimed pattern, and thus, it is possible to prevent the gases from being trapped between each electrode and a separator so that an electrode assembly is maintained in a stable form and does not deform due to pressure build-up. In this way, it is possible to prevent premature deterioration of electrodes, thereby improving the battery life. Kawakami, as discussed above, fails to disclose the presence of a pattern in the gel polymer sheet, and as clearly and explicitly shown above, only discloses a gel polymer sheet of uniform size. Furthermore, it will be appreciated that coating of entire surfaces without forming a pattern (Kawakami, FIG. 3D) does not provide a suggestion or incentive to modify Kawakami to obtain the required impregnation and gas discharge performance of the separator of the instant Specification, as the disclosure of Kawakami corresponds to that of the Comparative Examples of the instant Specification. See e.g., Comparative Examples 2 and 3 in the instant Specification and on pp. 11-12, and p. 6, line 23 to p. 7, line 7. Kawakami is thus silent as to any pattern feature in a separator which would be useful in providing a gas dissipation path. There is therefore no teaching or suggestion to modify Kawakami to include such a feature in the gel polymer sheet. The present invention is thus nonobvious.

Therefore, to summarize, Kawakami discloses only a gel polymer sheet with uniform size and therefore neither explicitly nor implicitly discloses all limitations of the instant claims. Further, there is no suggestion or incentive to modify the gel polymer sheet to have a

regular pattern to provide a gas diffusion pathway as disclosed in the instant Specification. For at least these reasons therefore, Kawakami does not anticipate or render unpatentable Claims 1 and 5 and their dependent claims.

As to the anticipatory and obviousness rejections of Claims 1, 2, 5-7, 10 and 12 over Lee, Lee discloses a multi-component composite film used for a polymer electrolyte for electrochemical devices. The multi-component composite film includes a porous gellable polymer layer formed on one side or both sides of a polymer support layer film. Lee, Abstract. The polymer support layer and the gellable polymer are united without an interface due to interdiffusion of the gellable polymer into the support film. Lee, [0026]. The gellable polymer support layer is formed by either coating the polymer support with gellable polymer solution or by applying the gellable polymer solution to a release paper, drying, and applying to a polymer film, then heat setting. Lee, [0042]. Patterning of the coated gellable polymer is not disclosed.

The Examiner fails to identify any disclosure in Lee of a patterned gellable polymer disposed on a polymer support layer. Thus, the Examiner has thus failed to meet the burden of identifying all elements of instant Claim 1 in the disclosure of Lee, and Lee therefore does not disclose all limitations of Claim 1 and cannot explicitly anticipate Claim 1 as alleged.

In addition, Lee fails to disclose the limitation that the gel polymer covers 40-60% of the surface of the separator as a regular pattern, *based on the surface to be covered*. As discussed above, in 13 of FIG. 4, a regularly spaced pattern of circular gel polymer areas is disposed on one coated surface of the separator, meeting the requirement to coat 40-60% of each surface to be coated as clarified in Claims 1 and 5 as amended. It will be appreciated that coating 100% of one surface and 0% of another surface as allegedly disclosed in Lee based on the Examiner's interpretation of Lee [0036] which states "coating the support layer film with the solution to form a gellable polymer layer on either or both sides of the support layer film" (where the Examiner states that 50% of the surface in Lee is coated based on one side being completely coated and the other not; See Final Office Action dated January 7, 2010, p. 5, lines 11-13) does not amount to the same thing, where 100% coating is greater than the 40-60% as instantly claimed, and 0% is less than the 40-60% as instantly claimed.

This does not equate to forming a gellable polymer pattern covering 40-60% of each coated surface as required by instant Claims 1 and 5 as amended.

Further with respect to any allegation of inherency, as in *Kawakami*, Lee does not disclose the formation of patterns on a substrate, but only discloses methods which would provide a uniform coating (casting from solution or transfer by tape release). Further, Lee clearly discloses filling of pores in the polymer film by the gellable polymer layer which one skilled in the art will recognize as effecting both a complete and thorough coverage of a surface, where the gel polymer interpenetrates with the substrate. Lee is silent as to pattern formation in a gellable polymer layer. One skilled in the art will appreciate that solution casting and tape-release processes complete coverage, they do not teach that a pattern would *necessarily* form. Applicants in fact contend that based on the teachings of Lee, there is little probability that anything other than a complete and uniform coating would be formed. *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Int. 1990); *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981) (holding that inherency must flow as a *necessary* conclusion from the prior art, not simply a possible one). Therefore, there is no indication that the limitation of a *patterned* gellable polymer layer would be inherent to the disclosure of Lee.

For these reasons at least, Lee does not anticipate Claims 1 and 5 or their dependent claims either explicitly or implicitly.

As to the obviousness rejections of these claims over Lee, Lee fails to teach all elements of the instant claims and therefore fails to provide a prima facie case of obviousness. Further, Lee fails to provide a suggestion or incentive that would lead one skilled in the art to modify Lee to have a pattern. *In re Laskowski*, Id. Lee discloses forming a coated surface with interpenetration of the gellable polymer into a polymer substrate, but does not disclose inclusion of a pattern over 40-60% of the surface of the substrate. In a rechargeable lithium battery having the structural characteristic as described in the instant claims however, a path for discharging gases generated from electrode reactions can be obtained from the patterning, and thus, it is possible to prevent the gases from being trapped between each electrode and a separator so that an electrode assembly is maintained in a stable form. Therefore, it is possible to prevent premature deterioration of electrodes, thereby improving the battery life.

Lee is silent as to this feature. Furthermore, it will be appreciated that coating of entire surfaces without forming a pattern (Lee, [0036], as relied on by the Examiner), does not provide a suggestion or incentive to modify Lee to obtain the required impregnation and gas discharge performance of the separator of the instant Specification, as the disclosure of Lee corresponds to that of the Comparative Examples of the instant Specification. See e.g., Comparative Examples 2 and 3 in the instant Specification and on pp. 11-12, and p. 6, line 23 to p. 7, line 7. There is therefore no teaching or suggestions to combine elements of the prior art to produce the present invention. The present invention is thus nonobvious.

Therefore, to summarize, Lee discloses only a gellable polymer coating disposed on one or both surfaces of a support without a pattern as required of the instant claims, and without the 40-60% coverage of each coated surface as required of the instant claims, and therefore neither explicitly nor implicitly discloses all limitations of the instant claims. Further, there is no suggestion or incentive to modify the gellable polymer coating to have a regular pattern to provide a gas diffusion pathway as disclosed in the instant Specification. For at least these reasons therefore, Lee does not anticipate or render unpatentable the instant independent Claims 1 and 5, or their dependent claims.

Thus, in summary, both Kawakami and Lee disclose a simple lamination or coated structure of a polymer gel on a support member or a polymer support layer film. Each reference fails to disclose a patterned polymer gel layer having the required surface coverage of each coated surface, and each reference fails to provide a suggestion or incentive to modify the reference (Kawakami or Lee) to include a patterned polymer gel layer.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise,
please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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